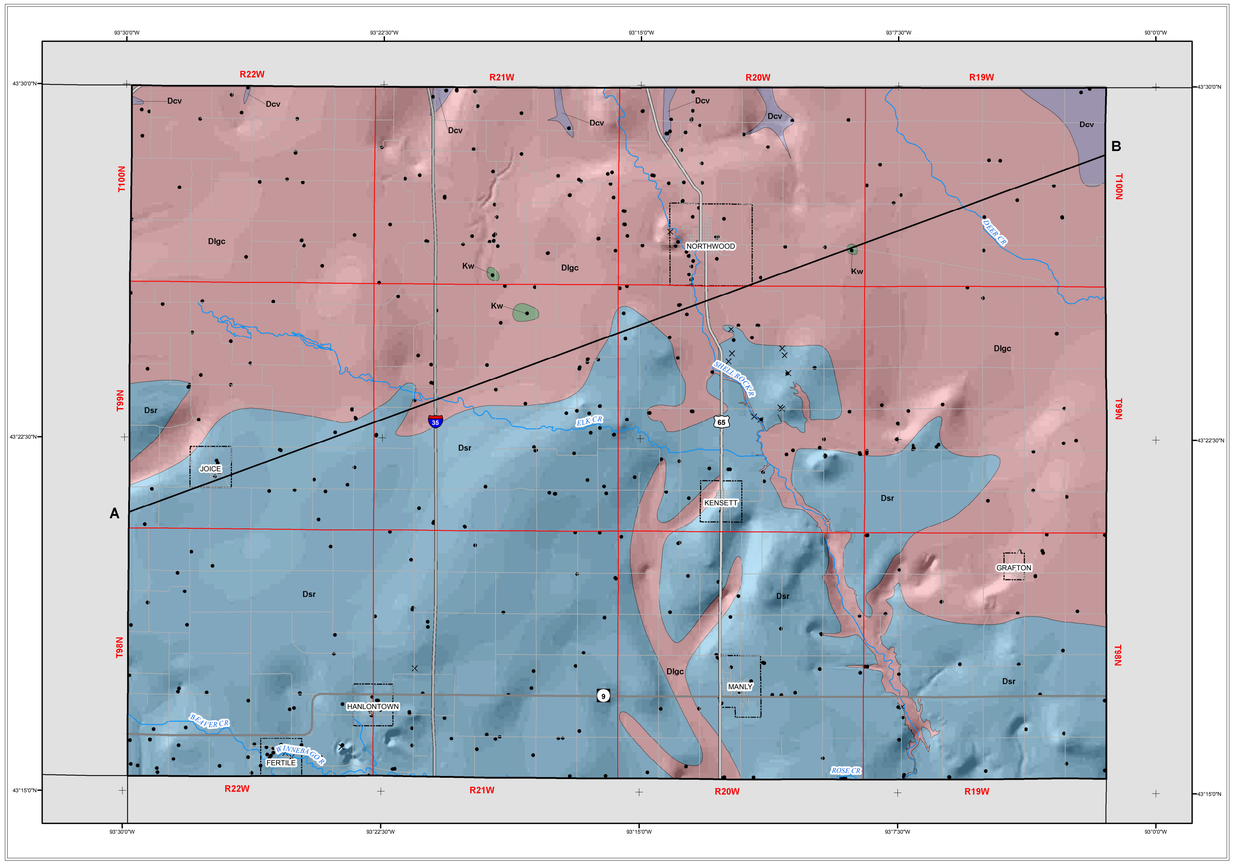
Bedrock Geology of Worth County, Iowa

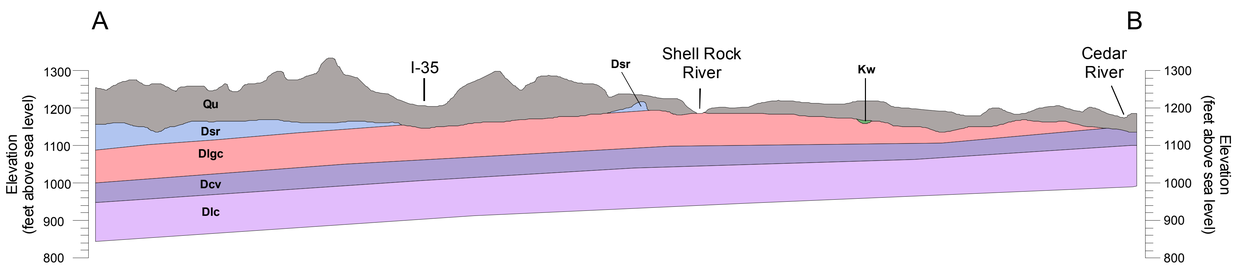


1:100,000

0 1 2 4 6 8 Miles

0 1 2 4 6 8 Kilometers

GEOLOGIC CROSS-SECTION A-B



Base map from iowa DOT Road Map Layers 2009.

Iowa Geological and Water Survey digital cartographic file Worth_Co_BedrockGeology2012.mxd, version 9/28/12 (ArcGIS 10.0)
Map projection and coordinate system based on Universal Transverse Mercator (UTM) Zone 15, datum NAD83.

The map and cross section are based on interpretations of the best available information at the time of mapping. Map interpretations are not a substitute for detailed site specific studies.

BEDROCK GEOLOGY OF WORTH COUNTY, IOWA

Iowa Geological and Water Survey
Open File Map OFM-12-01
September 2012

prepared by

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LEGEND

CENOZOIC

QUATERNARY SYSTEM

Qu

Qu – Undifferentiated Unconsolidated Sediment Consists of loamy soils developed in loess, glacial till, and colluvium of variable thickness, and alluvial clay, silt, sand, and gravel. The total thickness is usually less than 15 m (50 ft) in the eastern part of the county, but can be up to 59 m (195 ft) in the northwestern part of the mapping area. This unit is shown only on the cross-section, not on the map.

MESOZOIC

CRETACEOUS SYSTEM

Kw

Kw – Sandstone, Mudstone, and Siderite Pellets (Windrow Formation) "Mid"-Cretaceous. This map unit occurs as erosional outliers and is only found occasionally in well cuttings in the mapping area. The formation is characterized by reddish shaly sandstone and mudstone or siderite pellets. Its thickness is variable, but usually less than 6 m (20 ft).

PALEOZOIC

DEVONIAN SYSTEM

Dsr

Dsr - Limestone, Dolomite, and Shale (Shell Rock Formation) Upper Devonian. This map unit comprises most of the bedrock surface in the southern part of the mapping area, and usually has a thickness of 12 to 18 m (40-60 ft), but can thicken to 36 m (120 ft) toward the southwest of the mapping area. The unit is characterized by fossiliferous carbonates with some grey to light green shale and/or argillaceous carbonates. Layers containing abundant subspherical and tabular stromatoporoids commonly occur in the lower part of the unit. Brachiopods, bryozoans, corals, and crinoids are abundant in some intervals.

Dlgc

Dlgc - Dolomite, Limestone, and Shale (Lithograph City Formation) Middle to Upper Devonian. This map unit forms the major uppermost bedrock in the northern part of the mapping area, with a maximum thickness of up to 34 m (110 ft). This unit consists of dolomite and dolomitic limestone, partially characterized by interbeds of laminated lithographic and sublithographic limestone and dolomitic limestone, in part argillaceous or with little shale. "Birdseye," vugs, and calcite vug fills are common. Some intervals are fossiliferous and stromatoporoid-rich.

Dcv

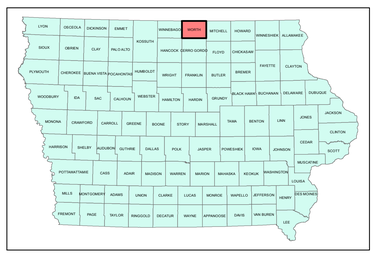
Dcv - Limestone and Dolomite (Coralville Formation) Middle Devonian. This formation is only present on the bedrock surface in northeast corner and in subsurface valleys along northern border of the mapping area. The thickness of this map unit varies between 11 and 18 m (35-60 ft). It is dominated by limestone, dolomitic limestone, and dolomite, in part laminated and argillaceous. Brachiopods, echinoderm debris and corals usually occur in the limestone facies.

Dlc

Dlc - Dolomite and Limestone (Little Cedar Formation) Middle Devonian. The thickness of this formation ranges from 27 to 35 m (90-115 ft) in the study area. The unit is dominated by slightly argillaceous to argillaceous dolomite and dolomitic limestone, usually vuggy and partially laminated and/or cherty. This unit is commonly fossiliferous, and brachiopods are especially abundant in the lower portion. This unit is shown only on the cross-section, not on the map.

• **Drill Holes**

× **Outcrops**



Introduction to the Bedrock Geology of Worth County, Iowa

Worth County lies along the border area of the Des Moines Lobe landform region, which was the last area covered by a Quaternary glacial advance in Iowa, and the Iowan Surface landform region, which was modified by various episodes of erosion before Wisconsinan glacial events (Prior, 1991). Because of the extensive glacial and erosional activities, the land surface in this area has a relatively low topographic relief.

The land surface in Worth County is mostly covered by Quaternary deposits, with an average thickness of less than 15 m (50 ft) in the eastern part of the county on the Iowan Surface landform region. However, the Quaternary is significantly thicker, with a maximum thickness of 59 m (195 ft), in the western part of the county within the Des Moines Lobe region. Bedrock outcrops were only found along the Shell Rock River and the Winnebago River. Quarries and bedrock outcrops along the two rivers provided significant information for the regional bedrock stratigraphic study. Subsurface information was also derived from the analysis of water well materials collected by Iowa Geological and Water Survey (IGWS) and stored in the GEOSAM database. A total of 28 outcrops and 583 private and public wells within the mapping area were studied. Stratigraphic information from the surrounding area, including outcrops/quarries and well materials, was also used for the bedrock geologic map.

Paleogeographically, the mapping area is within the northern region of the Devonian Iowa Basin. Middle and lower Upper Devonian rocks form the major bedrock surface and upper bedrock aquifer in Worth County. The stratigraphy of the Devonian Iowa Basin has been intensively studied (e.g., Belanski, 1927, 1928; Koch, 1970) and re-studied and correlated by Witzke and Bunker (1984), Anderson (1984), Bunker and others (1986), Witzke and others (1988), Anderson and Bunker (1998), Groves and others (2008). The bedrock surface of some separate 7.5' quadrangles in the county was mapped by Liu and others (2010a & b, 2011a & b), and local stratigraphy around the mapping area has been recently updated by McKay and Liu (2012). The stratigraphic nomenclature and correlation for this map follow the stratigraphic framework proposed by Witzke and others (1988).

The youngest bedrock unit within Worth County is the Cretaceous Windrow Formation, which usually occurs as iron-rich reddish erosional outliers a few meters thick in north-central Iowa (Witzke *et al.*, 2010). The Devonian rocks are dominated by carbonates varying between limestone and dolomite, accompanied with minor shale. Based on lithologic features and fossils, the Devonian bedrock in the mapping area can be subdivided into, in descending order, the Shell Rock, Lithograph Gty, and Coralville formations. The Shell Rock Formation forms most of the bedrock surface in the southern part of the mapping area and is characterized by fossiliferous carbonates. Commonly, a 2-meter-thick stromatoporoid-rich facies occurs near the base of the formation. Shaly and/or argillaceous carbonates also occur in the middle portion of the Shell Rock Formation. Thickness of the Shell Rock Formation is normally about 20 m (65 ft), but can thicken up to 37 m (120 ft) in the southwest. The underlying Lithograph City Formation is usually represented by laminated lithographic and sublithographic limestone and dolomite, and is the dominant uppermost bedrock unit in the northern part of the mapping area. "Birdseye," vugs, and calcite vug-fills are common in some layers. Locally, a meter-thick fossiliferous and stromatoporoid-rich facies occurs near the middle of the formation. The maximum thickness of the Lithograph City Formation is about 34 m (110 ft) in the mapping area. The Coralville Formation is characterized by limestone, dolomitic limestone, and dolomite, sometimes argillaceous. Echinoderm debris, corals, and brachiopods are common in some layers. The Coralville Formation forms the bedrock surface only in the northeast corner and in bedrock valleys along the northern border of the mapping area. Thickness of the Coralville Formation varies between 11 and 18 m (35-60 ft), but usually is less than 15 m (50 ft) in this area.

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Correlation of Map Units